



# FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

## IMPROVING EFFICIENCY IN THE NIGERIAN AQUACULTURE SECTOR BY EMPLOYING LEAN PRODUCTION SYSTEMS

The aquaculture sector has been growing at a rate faster than any other food production sector in the world. Aquaculture now contributes nearly 50% of total fish consumption worldwide. Although aquaculture is growing and is poised to contribute more to global food demand, the sector faces significant challenges and bottlenecks. Many critical issues continue to stifle aquaculture growth in Africa. Nigeria is Africa's second-largest aquaculture producer and continues to struggle to bridge the gap between production output and domestic fish consumption demand.

### LEAN MANAGEMENT TECHNOLOGY

Toyota Motor Corporation revolutionized the automobile industry with its Toyota Production System, which has evolved into a wellspring of competitive advantages.

The primary goal of this system, also called Lean management, is to minimize costs or maximize efficiency by eliminating waste and converting waste into value. Waste reduction and process optimization are key components to improve quality and delivery while conserving resources like time and money.

Despite the overwhelming evidence that several agricultural businesses are adopting Lean practices and benefiting from them, others in the sector are less prepared to implement the tools used in Lean management. Further, the integration and application of Lean principles to aquaculture is largely still in its infancy, yet the sector represents a huge opportunity for efficiency gains.

### ACTIVITY OBJECTIVES

Considering the importance of better understanding the production and processing inefficiencies in Nigerian aquaculture and finding solutions for improvement, a Feed the Future Innovation Lab for Fish activity examined the suitability and practicality of using the Lean management concept and training fish farmers on effective practices. The specific objectives were to use Lean management to improve operational efficiency, reduce post-harvest losses, improve waste management, and decrease the cost of production.

### SUMMARY RESULTS

The results showed significant improvements in aquaculture value chain efficiency in Nigeria after the intervention, which suggests that the Lean approach has successfully minimized inefficiencies in fish farms in Ogun and Delta States. With rare exceptions, farmers reaped benefits from Lean training, regardless of age, gender, geographical location, company status, farm type, farm size, and annual income. Findings demonstrate the ability of Lean management practices to continue helping the Nigerian aquaculture sector and individual farmers to drastically reduce waste and become more profitable. Building a more resilient aquaculture industry in Nigeria requires equipping farmers with the tools to address different types of on-farm waste, and this study demonstrates that Lean management tools are simple to incorporate and effective.



Fish farmers discussing Lean technology near aquaculture ponds.  
Photo by Elizabeth Akuwa



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## ACTIVITY TEAM

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## KEY FINDINGS

The application of Lean management principles addresses 14 domains of waste, including reduction in time, fish mortality, and labor cost. Lean management tools also contributed to efficiency in energy use, inventory space, labor, feed cost, and feed quantity. The other domains that improved were reduction in medication cost, water treatment cost, transportation cost, maintenance cost, and fish losses.

## KEY BENEFICIARIES

- The activity trained 40 Nigerian aquaculture value chain actors and certified them as Lean Subject Matter Experts in aquaculture. These trainees have been equipped with the necessary tools to train others to adopt and disseminate the Lean management tools.
- In all, more than 340 aquaculture value chain actors benefited directly from Lean management training, including about 20% women. The statistical analyses attest

that women were good adopters of Lean innovation, as were their male counterparts, and that they could help scale up the technology.

- Although aquaculture in Nigeria is considered a pastime of retirees and is dominated by older people, the research team made efforts to include youth. Ten percent of participants were under 31 years old. Only 10% of participants were older than 57 years.
- The activity included actors with small, medium, and large-scale aquaculture activities. Although most farmers identified as smallholders, the activity targeted participants with corporate recognition and demonstrated that Lean tools can benefit all groups.
- Although pond aquaculture is the popular system of choice in Nigeria and accounted for 75% of the systems used by the participants, users of tank systems (18.5%) and other systems (6%) benefited from how Lean approaches contributed to improving the efficiency of their aquaculture production businesses.
- Although the participants came from two states, outreach webinars suggest that the innovation could benefit many groups beyond the borders of these states.

## RECOMMENDATIONS

- Given the reported benefits of Lean tools in the two Nigerian states, the scope of Lean management should be expanded to other states, the West African subregion, and elsewhere in the world by extensively disseminating the study findings through publications, conferences, webinars, etc.
- Since community-based Lean Subject Matter Experts can be effective resources for disseminating Lean tools, they should be certified as trainers and paid for their services to ensure the continuity of the activity beyond its end date.

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## ABOUT THE FISH INNOVATION LAB

The Fish Innovation Lab supports the United States Agency for International Development's agricultural research and capacity building work under Feed the Future, the U.S. Government's global hunger and food security initiative. Mississippi State University is the program's management entity. The University of Rhode Island, Texas State University, Washington University in St. Louis, and RTI International serve as management partners.

[www.fishinnovationlab.msstate.edu](http://www.fishinnovationlab.msstate.edu)

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